

**TITLE: "Film folding and supplying apparatus for stretch film packaging machines"**

**DESCRIPTION**

The invention relates to constructive improvements in the film folding and supplying unit for the machines described in the Italian patent n. 1 266 296, property  
5 of the same applicant, to which is made wide reference. In this type of machines, the packaging film has a width which is suitable to the packaging of products which have variable dimensions inside a large range and its width is proportionate to that of the products having the greatest dimension that the machine can wrap. The width of the film is adapted to the dimensions of the product to be wrapped, with a process of  
10 pleating of the same film during the feeding phase to the wrapping phase, so that the longitudinal axis of the pleats results to be oriented in the length direction of the portion of film inserted in said station and such that the in the packaging of products having small dimensions, it is in any case provided for the formation of a wrapping which is enough wrapped and blocked. In this type of machines, the film is unwound  
15 from the feeding bobbin, passes trough the tightening pulley which provides a longitudinal tensioned feeding and then is transmitted on a transversal and arched roller which transversally tensions the same and avoid the formation of uncontrolled pleats because the film is coming out from said roller with an ascending direction and runs longitudinally with an own center portion, on a rectilinear guide anteriorly  
20 provided with an idle roller which facilitates the entry of the film the lateral edges of which are folded under said guide by means of respective lateral guides, the whole in such a manner that the film results folded with a pressed omega transversal shape, and presents in such manner a width which is proportionate to the width of the product to be wound. Said curved transmission roller has been resulted of difficult  
25 realisation so that it has been thought to substitute the same with a composite roller formed by a central roller and two long lateral rollers, having the same distance from the central roller with an angle of about 170°. Another drawback found in the apparatus of the known type, is due to the great contact surface of the film with the folding guides above mentioned which were realised with polished metal or with  
30 material having a low friction coefficient. To improve the folding action performed by

the guides, the same have been provided on the edges which was before operating in contact with the film, with rows of idle wheels with which the film is co-operating with rolling friction.

5 The lateral edges of the film which is coming out from said folding which are external to the folded portion of the said film, run upon rubber and idle rollers upon which the same are maintained in contact by a contrast superior roller, idle, but made of metal and sprung, after that the folded film arrives to a gripper-shaped distributor, made by a lower fixed portion, to which there is fixed in projecting manner said longitudinal and central guide, and by an upper portion assembled upon a structure  
10 which may oscillates upon an anterior axis which is parallel to the same distributor, and which is carrying the final folder of the machine, the one which is folding on the bottom of the product the last portion of film previously retained by the same distributor, and which is carrying the heated conveyor for the welding of the lower edges of the packaging. This structure may be raised with oscillation upon said transversal axis, in the initial phase in which the film coming from a new bobbin must  
15 be inserted in a machine. Upon this structure there is assembled said metallic and sprung roller which co-operates with said rubberised rollers. The distributor of the film realised with the known technique, is complex and scarcely reliable, so that a further object of the invention is to improve the distributor and to provide freewheel means in the upper metallic roller contrasting the rubberised rollers, in such a manner that the  
20 film which passes through said rollers may only go forward and not backward.

In the apparatus of the described type, both folding guides of the lateral edges of the film fed by the machine, and the rubberised rollers, are pre-arranged to be automatically adjustable in the reciprocal distance by means of self-centring  
25 regulation mechanism, controlled by an electric step motor controlled by the computer of the machine which by means of the optical barriers detects the dimensions of the products to be packaged, to automatically adjust to these the width of the packaging film. It has been find out that it is possible to realise packaging machines more economic and able to give the same quality of packaging of the  
30 above mentioned machines, using rubberised contrast rollers having a sufficient

length and with static positioning and pre-arranging the guides for the folding of the edges of the film fed by the machine, with a manual regulation of the reciprocal distance. The products that the packaging machine may process are dimensionally divided in two groups, the group of the medium-small products and the group of the large products and for each group of products there are used film bobbins of different width, naturally more wide for the group of wide products, so if the machine had to pass from the operation of a group of products to another group of products, the bobbin of the film is changed and the pleating means of the same film are adjusted in suitable manner. When the machine is pre-arranged for the processing of a group of products, the width of the folded film is chosen with regard to the width of the products having the smaller dimensions of that group and the width of the pleated film may be adjusted or remain constant, both for working of the small products and for the large ones of the same group.

These and other features of the improvements which is referred to and the advantages deriving therefrom, will appear better evident from the following description of a preferred embodiment of the same, made by way of non-limiting example, with reference to the figures of the attached sheets of drawings, in which:

- Fig. 1 is a plan view from the top of the improved apparatus which is referred to, without the overhanging structure which carries the sprung roller opposed to the rubberised rollers and the upper comb of the final distributor;
- Fig. 2 shows other details of the apparatus longitudinally sectioned along the line II-II of Figure 1;
- Fig. 3 shows the complete final distributor of the film as from Figure 2, in closing position and sectioned along the line III-III of Figure 1;
- Fig. 4 shows other details of the apparatus transversally sectioned along the line IV-IV of Figure 1;
- Fig. 5 shows further details of the distributor sectioned along the line V-V of Figure 2.

It must be stated that the terms front and rear are here considered with reference to the running direction of the film, therefore it will be defined as front that portion which for the first is interested from the same film in its advancement. In Figures 1 and 2, with numeral reference 1 is indicated the horizontal traverse fixed with its ends to the sides of the frame of the machine, transversally to the path of the film F and which is carrying the lower jaw of the distributor of the same film, as mentioned after. In the centre line of the front of the traverse 1, there is projecting fixed, by means of screws 2, the enlarged end 203 of the longitudinal member 103 of a ribbed structure 3 which has in plant a cross shape which is longitudinally downwardly inclined, upon said end 203 being rotatably assembled the intermediate portion of a shaft 104 which is parallel to the traverse 1 and on the ends of which there are keyed the rubberized and equal rollers 4, 4', which support the lateral edges of the film which is coming out from the folding means further mentioned. The rollers 4, 4' have a length which is superior to these provided in the known art and their reciprocal distance remains the same upon variations of the products to be packaged. The most lower end of the longitudinal member 103 of the structure 3 ends with a fork conformation 303, which in its interior supports projecting and rotatably a roller 5 and which with its sides, which are diverging and inclined of about 8°-10° supports rotatably longer and equal rollers 105, 105', that with the roller 5 make a convex transmission which substitutes the arcuate roller in the prior art, upon which is transmitted the film unwound from the bobbin and coming from the tensioning pulley, to be transversally stretched, to be maintained centred on the following folding means and to be pre-arranged in the best manner for the co-operation with said means.

The longitudinal member 103 of the structure 3, carries superiorly distributed projections 6 upon which there is fixed with screws 7 the longitudinal and median portion of a plate 8 with rectangular plan shape, having suitable dimensions, the longitudinal edges of which are slightly upwardly inclined and freely support rotatably rows of wheels 9, 9' with a rounded shape, which are suitable projecting from said support edges of the plate 8, to substitute these in the guiding of the film during the

folding phase. At the end of each rows of wheels 9, 9', and in conditions of substantial tangency with the external edge of these, the plate 8 supports plates 10, 10', with edges which are suitably rounded and with a low friction coefficient with the film. In the centre-line of the anterior end of the plate 8 there is inferiorly fixed, and  
5 with a longitudinal arrangement, a support 11 which is anteriorly projecting from the same plate to rotatably support a side by side couple of rollers 12 having the same dimensions, the general width of which is substantially equal to the width which exists between the external sides of the rows of wheels 9, 9'. The film which leaves by the convex transmission means made by rollers 5, 105, 105', is resting with its median  
10 and longitudinal band on the sliding structure made by the rollers 12 and by the wheels 9, 9' and the same film is folded under said rows of wheels, by the convex sides of guides 13, 13', reinforced by upper and longitudinal inserts 14, 14' and provided with intermediate appendices 113, 113' for the outside extension, with which said guides are fixed at the ends of the transversal arms 403, 403' of the cross  
15 structure 3 above mentioned (see further). The convex edges of the guides 13, 13' carry a slightly downwardly bent portion, under which there are fixed the one following the rows of wheels 15, 15' of the same kind of those with numeral reference 9, 9', which with the exception of the first ones are projecting from said edges for the cooperation with rolling friction with the lateral edges of the film F which for the  
20 operation with said means, is folded under the guiding median complex formed by the portions 8, 9, 9', as it appears from Figure 4, in such a manner to take an omega transversal shape. From Figure 4 it is clear how thanks to the slight inclination of the axles of the rows of wheels 9, 9' and 15, 15', the film touches only a portion of the circumference of the said wheels and it is distant from the superior and inferior faces  
25 of the same wheels. From Figures 1, 2 and 4 it is noted that the arms 403, 403' of the structure 3 are also ribbed with a U overturned shape and terminate with flat and enlarged appendices upon which there are provided at different distances from the longitudinal member 103 of the same structure 3, couples of threaded holes 16, 16' in which there can be fixed corresponding couples of screws 17, 17' which are fixing  
30 in working position the guides 13, 13' with the relative rows of wheels 15, 15'. The

screws 17, 17' pass through corresponding slots 18, 18' obtained on the guides 13, 13', with a perpendicular orientation to the travelling direction of the film F. In the Figures 1 and 4, the screws 17, 17' are positioned on the more internal holes 16, 16' and are abutting against the external ends of the slots 18, 18', in such a manner that the guides with the rows of wheels 15, 15' are in the position of maximum folding of the film under the central guide with the rows of wheels 9, 9'. If required, the screws 17, 17' may be positioned on the more external couple of holes 16, 16', and the slots 18, 18' may be carried against with said screws, with their internal ends, in such a manner that the rows of wheels 15, 15' result to be substantially positioned outside of the rows of wheels 9, 9'. It is clear that depending on the film used and on the product to be packaged, the guides with the rows of wheels 15, 15' may be placed in any intermediate position comprised between the extreme positions above mentioned.

From Figures 1, 2 and 4 it is noted that the film which is coming out from the described folding means, is transversally surmounted by the steel sprung roller 19 which pushes the edges of the same film on rubberised rollers 4, 4' and as mentioned in the introduction of the present description, it is now assembled upon its support axle, with the interposition of free-snap wheels, in such a manner that the film may only move forward between said rollers, and not recede. The sprung roller 19 is assembled on the sides of the known type structure 20 which carries the motorised conveyor 21 for the displacement of the packaged products and for the thermo-welding of the lower edges of the packaging film and that in co-planarity conditions with the upper portion of the said conveyor, supports motorised rollers 22 which are parallel between them and to the said roller 19, between which there is co-planarly arranged the fixed runner 23 provided with a recess 123 downwardly open, which houses the toothed saw 24 (Fig. 5) against which is pushed the packaging film by means of a parallel and grooved lifter, not shown. Structure 20 is anteriorly fulcrumed to the frame of the machine, with lateral hinges 25, in such a manner that can be raised together with the roller 19, to facilitate the introduction of the film between the folding means each time that the bobbin of the packaging film must be

replaced and the same film must be correctly transmitted between the same folding means described.

From Figures 1, 2 and 5 it is noted that the traverse 1 is placed with its upper wall at a level which is slightly superior to that of the film which is passing between the rollers 19, 4, 4', has the rounded edges and the same traverse 1 is anteriorly and superiorly open with a recess 26 which has substantially the same length of the distance which passes between the external sides of the rollers 4, 4' and in which there is fixed with the screws 27, a jaw 28 having the shape of a small square member, the upper wall 128 of which is co-planar to the one of the traverse 1 and is comb-shape, with the teeth oriented and opened in the travel direction of the film. Upstream of the comb 128, the upper portion of the traverse 1 carries a recess which is parallel to the same comb, in which there is housed, not projecting a rubberised grooved insert 29 which is blocked in situ for example by means of end screws 30. Outside of the unit 28, 29, at a short distance from its ends, on the traverse 1 are superiorly provided recesses which house electromagnets 31, 31' (see also Figure 3). Over of the traverse 1, at a short distance and parallelly to this one there is arranged with its flat and toothed portion which forms a comb 132 complementary to the lower comb 128, a jaw 32 L-shaped to resist to the bending-torsion stresses, which is upwardly raised with its anterior ribbed portion, which is provided at least on the ends with transversal ribs 232, 232', and which is carrying laterally pins 33, 33', which are parallel to their longitudinal axis and corresponding with the point of the teeth of the comb 132, which with the same jaw which is referred to is fulcrumed at corresponding supports 34, 34', fixed to the sides of the structure 20. The jaw 32 carries at its end, onward extension appendices 332, 332', pre-arranged in such a manner that on the same may operate the end of springs for downwardly urging, which maintain said appendices attested against lower and adjustable retainers 36, 36' fixed to the near sides of the structure 20, in such a manner that the upper comb 132 results opportunely spaced from the lower comb 128 and that the film may freely runs through the so made distributor. On the lower wall of the swinging jaw 32, upstream of the comb 132, there is fixed in relief a strip 37 of rubber and with

longitudinal lines. When the distributor is opened as from Figure 2, the strip 37 is raised and opportunely spaced from the lower one indicated with reference numeral 29, and from the ferromagnetic disks 38, 38' fixed to the inferior side of the same jaw 32 and centred with electromagnets 31, 31', are opportunely spaced from this latter components de-energized. When, on the contrary, the electromagnets 31, 31' are energized, as from Figure 3, these attract the above mentioned disks 38, 38' and cause downwardly oscillation of the portion of the upper jaw 32 which is provided of the rubber strip 38, which blocks the film on the lower rubber strip 29, in contrast with the action of springs 35, 35', which are proportionally compressed, in such a manner to re-open, at the right time, the distributor as the energization of the said electromagnets 31, 31' ceases. Suitable means may be provided for the partializing of the energization of the electromagnets, 31, 31', in order to allow that the film results to be always transversally seized with pliers in the distributor, but in a position in which it can suitably run in longitudinal direction. This condition may be, for example especially useful in the phase in which the packaging film is transversally pre-stretched by some of the lateral grippers of the packaging machine.